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09/847,968	05/02/2001	Robert W. Jones	10003979-1	7279

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AGILENT TECHNOLOGIES
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EXAMINER	
MISLEH, JUSTIN P	
ART UNIT	**PAPER NUMBER**
2612	

DATE MAILED: 08/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/847,968	Applicant(s) JONES, ROBERT W.	
	Examiner Justin P Misleh	Art Unit 2612	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 5 - 10, 13, 16, 17, 19, and 20* is/are rejected.

7)☒ Claim(s) *2 – 4, 11, 12, 14, 15, and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *5/2/01* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The Examiner suggests including features of the first and second groups of pixels.

2. The disclosure is objected to because of the following informalities: inconsistencies.

On page 10 (line 13), reference sign 628 should be relabeled 528 according to the remainder of specification and figure 5.

Appropriate correction is required.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference character(s) mentioned in the description: 208 (page 5, line 8).

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. **Claims 1, 5 – 10, 13, 16, 17, 19, and 20** are rejected under 35 U.S.C. 102(e) as being anticipated by Gallagher et al (US2002/0130957 A1).

6. For **Claim 1**, Gallagher et al. disclose, as shown in figures 1, 4, 6, and 7, and as stated in paragraphs 0028 (lines 3 – 7), 0029 – 0030, 0032 (lines 3 – end), 0039, 0042, 0044, 0046, 0048, 0050, a digital imaging system (see figure 1) for capturing a color image comprising:

an image sensor (10) having;

a first group of pixels that have a first light sensitivity for generating color-specific image data on a first scale for a first color (The first group of pixels corresponds to the "slow" green pixels, e.g. 34 in figure 6B, as indicated by an asterisk, having a "slower response" to the same light exposure); and

a second group of pixels that have a second light sensitivity for generating color-specific image data on a second scale for the first color (The second group of pixels corresponds to the "fast" green pixels, e.g. 40 in figure 6B, as indicated by the absence of an asterisk, having a "predetermined response" to a light exposure), the first and second group of pixels ("fast" green pixels 40 and "slow" green pixels 34) having a common

dynamic range wherein the light sensitivity of the first group of pixels overlaps with the light sensitivity of the second group of pixels (see paragraph 0050);

a scaling unit (slow pixel compensator 44) for receiving the image data from the first group of pixels ("fast" green pixels 40) and the image data from the second group of pixels ("slow" green pixels 34) and for outputting the image data on a common scale (scaled by a factor of 100/X; see below for explanation);

a demosaic unit (slow pixel thresholder 46 and fast pixel thresholder 48) for determining intensity values of the first color (identifying low quality fast and slow green pixels) using the scaled color-specific image data (output from the slow pixel compensator 44) that is generated from the first and second groups of pixels (output from the slow pixel compensator 44; see explanation below); and

an error correction unit (signal extender 50) for correcting the demosaiced intensity values (low quality fast and slow green pixels) of the first color (green) for the demosaiced intensity values of the first color (green) that are outside the common dynamic range (pixels that fall outside the under-exposed to saturated thresholds) of the first and second groups of pixels (see paragraphs 0058 – 0060 and explanation below).

Gallagher et al. disclose an image sensor (10) with a Bayer pattern color filter array comprised of red, green, and blue pixels. The color filter array is comprised of fast pixels corresponding to pixels with a predetermined response to a light exposure and of slow pixels corresponding to pixels with a slower response to the same light exposure. Each group of colored pixels (red, green, and blue) has an equal number of fast and slow pixels. Therefore, 50% of all the red pixels are slow pixels, 50% of all the green pixels are slow pixels, and 50% of

all the blue pixels are slow pixels. The slow green pixels correspond to the claimed "first group of pixels" and fast green pixels correspond to the claimed "second group of pixels".

Gallagher et al. also disclose an A/D Converter (14) for converting an image captured by the image sensor comprised of fast and slow pixels to an 8 bit logarithmic digital image. The digital image is input into the slow pixel compensator (44), which compensates the slow pixels by a linear factor of 100/X to correspond to the fast pixels, as shown in figure 4 and stated in paragraph 0054. The slow pixel compensator (44) corresponds to the claimed "scaling unit".

Once compensated, as stated in paragraphs 0055 – 0074, the digital image is color separated and fast/slow pixel separated wherein pixels that are of low quality, due to under-exposure, are identified and corrected for all of the slow red, green, and blue pixels, individually and respectively, and, likewise, pixels that are of low quality, due to saturation, are identified and corrected for all of the fast red, green, and blue pixels, individually and respectively. In other words, all of the slow red pixels that are of low quality are identified in the slow pixel thresholder (44) and are replaced by a nearby neighboring fast red pixel of good quality in the signal extender (50) and vice versa for all of the fast red pixels that are of low quality. This process is repeated for all the red, green, and blue fast and slow pixels. The slow and fast pixel thresholders (46 and 48) correspond to the claimed "demosaic unit" and the signal extender (50) corresponds to the claimed "error correction unit".

7. As for **Claim 5**, Gallagher et al. disclose, as shown in figure 2, 3, and 5 and as stated in paragraphs 0035 – 0041, the responses of the "slow" response pixels are slowed by altering the gain of the selected pixels, a "common practice" in "the art of digital camera design and

manufacture". As shown in figures 2, 3, and 5, Gallagher et al. disclose manufacturing the image sensor (10) for the expected level of contrast in an image.

8. As for **Claim 6**, Gallagher et al. disclose, as shown in figure 6B, wherein the first and second groups of pixels ("fast" and "slow") capture green image data at two different sensitivities ("predetermined response" and slower response").

9. As for **Claim 7**, Gallagher et al. disclose, as stated in paragraph 0039, that the response of the slow pixels is X% (where X<= 100) that of the fast pixels for the same exposure. The slow pixels has a response that is slowed by two stops (-log X/100) relative to the fast pixels, resulting in X = 25%. Therefore, the slow pixels (first group) have that response that is 25% (1/4) that of the fast pixels (second group).

10. As for **Claim 8**, Gallagher et al. disclose, as shown in figure 6B, wherein the image sensor (10) further comprises includes a third group of pixels that captures image data of a second color (red) and a fourth group of pixel that captured image data of a third color (blue).

11. As for **Claim 9**, Gallagher et al. disclose, as shown in figure 6B, wherein the first and second groups of pixels capture green image data, the third group of pixels captures red image data, and the fourth group of pixels captures blue image data.

12. For **Claim 10**, Gallagher et al. disclose, as shown in figures 1, 4, 6, and 7, and as stated in paragraphs 0028 (lines 3 – 7), 0029 – 0030, 0032 (lines 3 – end), 0039, 0042, 0044, 0046, 0048, 0050, an image processing unit (200) for processing color image data that is received from an image sensor (10), wherein the color image data received from the image sensor includes pixel values for a first color (green) on a first scale (fast pixel response; see figure 4), pixel values for the first color (green) on a second scale (slow pixel response; see figure 4), pixel values for a

second color (red; see figure 6B), and pixel values for a third color (blue; see figure 6B), the first scale and the second scale include a common dynamic range (see paragraph 0050), the image processing unit comprising:

a scaling unit (slow pixel compensator 44) for ensuring that the pixel values for the first color (green) on the first scale (fast pixel response), the pixel values for the first color (green) on the second scale (slow pixel response), the pixel values for the second color (red), and the pixel values for the third color (blue) are all on the same scale (scaled by a linear factor 100/X; see below for explanation);

a demosaic unit (slow pixel thresholder 46 and fast pixel thresholder 48) for receiving the pixel values for the first color (green), the pixel values for the second color (red), and the pixel values for the third color (blue) and for generating missing intensity values for the first, second, and third colors using the pixel values for the first color, the second color, and the third color (see explanation below); and

an error correction unit (signal extender 50) for correcting the demosaiced intensity values (low quality fast and slow green pixels) of the first color (green) that are outside of the common dynamic range of the first color pixel values (see paragraphs 0058 – 0060 and explanation below).

Gallagher et al. disclose an image sensor (10) with a Bayer pattern color filter array comprised of red, green, and blue pixels. The color filter array is comprised of fast pixels corresponding to pixels with a predetermined response to a light exposure and of slow pixels corresponding to pixels with a slower response to the same light exposure. Each group of colored pixels (red, green, and blue) has an equal number of fast and slow pixels. Therefore,

50% of all the red pixels are slow pixels, 50% of all the green pixels are slow pixels, and 50% of all the blue pixels are slow pixels. The slow green pixels correspond to the claimed "first color on a second scale" and fast green pixels correspond to the claimed "first color on a first scale".

Gallagher et al. also disclose an A/D Converter (14) for converting an image captured by the image sensor comprised of fast and slow pixels to an 8 bit logarithmic digital image. The digital image is input into the slow pixel compensator (44), which compensates the slow pixels of all three colors (red, green, and blue) by a linear factor of 100/X to correspond to the fast pixels of the same color, as shown in figure 4 and stated in paragraph 0054. The slow pixel compensator (44) corresponds to the claimed "scaling unit".

Once compensated, as stated in paragraphs 0055 – 0074, the digital image is color separated and fast/slow pixel separated wherein pixels that are of low quality, due to under-exposure, are identified and corrected for all of the slow red, green, and blue pixels, individually and respectively, and, likewise, pixels that are of low quality, due to saturation, are identified and corrected for all of the fast red, green, and blue pixels, individually and respectively. In other words, all of the slow red pixels that are of low quality are identified in the slow pixel thresholder (44) and are replaced by a nearby neighboring fast red pixel of good quality in the signal extender (50) and vice versa for all of the fast red pixels that are of low quality. This process is repeated for all the red, green, and blue fast and slow pixels. The slow and fast pixel thresholders (46 and 48) correspond to the claimed "demosaic unit" and the signal extender (50) corresponds to the claimed "error correction unit".

13. For **Claim 13**, Gallagher et al. disclose, as shown in figures 1, 4, 6, and 7, and as stated in paragraphs 0028 (lines 3 – 7), 0029 – 0030, 0032 (lines 3 – end), 0039, 0042, 0044, 0046, 0048,

0050, a method for capturing a color image with a digital imaging system (see figure 1) comprising:

capturing color-specific image data with a first group of pixels that have a first light sensitivity (The first group of pixels corresponds to the "slow" green pixels, e.g. 34 in figure 6B, as indicated by an asterisk, having a "slower response" to the same light exposure);

simultaneously capturing color-specific image data with a second group of pixels that have a second light sensitivity (The second group of pixels corresponds to the "fast" green pixels, e.g. 40 in figure 6B, as indicated by the absence of an asterisk, having a "predetermined response" to a light exposure), wherein the color-specific image data from the first group of pixels and the color-specific image data from the second group of pixels are for a first color (green) and wherein the first and second light sensitivities ("fast" green pixels 40 and "slow" green pixels 34) include a common dynamic range (see paragraph 0050);

bringing (by means of slow pixel compensator 44) the image data from the first group of pixels ("fast" green pixels 40) and the image data from the second group of pixels ("slow" green pixels 34) to a common scale (scaled by a factor of 100/X; see below for explanation);

determining (by means of slow pixel thresholder 46 and fast pixel thresholder 48) intensity values of the first color (green) for pixels (identifying low quality fast and slow green pixels) using the scaled color-specific image data (output from the slow pixel compensator 44; see explanation below); and

correcting (by means of signal extender 50) the determined intensity values (low quality fast and slow green pixels) for determined intensity values that are outside the common dynamic

range (pixels that fall outside the under-exposed to saturated thresholds) of the first and second groups of pixels (see paragraphs 0058 – 0060 and explanation below).

Gallagher et al. disclose an image sensor (10) with a Bayer pattern color filter array comprised of red, green, and blue pixels. The color filter array is comprised of fast pixels corresponding to pixels with a predetermined response to a light exposure and of slow pixels corresponding to pixels with a slower response to the same light exposure. Each group of colored pixels (red, green, and blue) has an equal number of fast and slow pixels. Therefore, 50% of all the red pixels are slow pixels, 50% of all the green pixels are slow pixels, and 50% of all the blue pixels are slow pixels. The slow green pixels correspond to the claimed "first group of pixels" and fast green pixels correspond to the claimed "second group of pixels".

Gallagher et al. also disclose an A/D Converter (14) for converting an image captured by the image sensor comprised of fast and slow pixels to an 8 bit logarithmic digital image. The digital image is input into the slow pixel compensator (44), which compensates the slow pixels by a linear factor of 100/X to correspond to the fast pixels, as shown in figure 4 and stated in paragraph 0054. The slow pixel compensator (44) corresponds to the claimed "scaling unit". Once compensated, as stated in paragraphs 0055 – 0074, the digital image is color separated and fast/slow pixel separated wherein pixels that are of low quality, due to under-exposure, are identified and corrected for all of the slow red, green, and blue pixels, individually and respectively, and, likewise, pixels that are of low quality, due to saturation, are identified and corrected for all of the fast red, green, and blue pixels, individually and respectively. In other words, all of the slow red pixels that are of low quality are identified in the slow pixel thresholder (44) and are replaced by a nearby neighboring fast red pixel of good quality in the

signal extender (50) and vice versa for all of the fast red pixels that are of low quality. This process is repeated for all the red, green, and blue fast and slow pixels. The slow and fast pixel thresholders (46 and 48) correspond to the claimed "demosaic unit" and the signal extender (50) corresponds to the claimed "error correction unit".

14. As for **Claim 16**, Gallagher et al. disclose, as shown in figure 6B, wherein the first and second groups of pixels ("fast" and "slow") capture green image data at two different sensitivities ("predetermined response" and slower response").

15. As for **Claim 17**, Gallagher et al. disclose, as shown in figure 6B, wherein the first and second groups of pixels ("fast" and "slow") capture green image data at two different sensitivities ("predetermined response" and slower response").

16. As for **Claim 18**, Gallagher et al. disclose, as shown in figure 6B, wherein the image sensor (10) further comprises includes a third group of pixels that captures image data of a second color (red) and a fourth group of pixel that captured image data of a third color (blue).

17. As for **Claim 19**, Gallagher et al. disclose, as shown in figure 6B, wherein the first and second groups of pixels capture green image data, the third group of pixels captures red image data, and the fourth group of pixels captures blue image data.

Allowable Subject Matter

18. **Claims 2 – 4, 11, 12, 14, 15, and 18** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

19. As for **Claims 2, 11, and 14**, while the prior art discloses an A/D Converter for converting an image captured by an image sensor comprised of fast response and slow response pixels to an 8 bit logarithmic digital image, wherein the slow response pixels are compensated by a linear factor to correspond to the fast response pixels, wherein the compensated digital image is separated into individual pixels according color and fast/slow response, wherein individual pixels that are of low quality, due to under-exposure (corresponding to low quality slow response pixels), are identified and replaced by a nearby fast response pixel of good quality of the same color, and, likewise, wherein individual pixels that are of low quality, due to saturation (corresponding to low quality fast response pixels), are identified and replaced by a nearby slow response pixel of good quality of the same color, wherein all the pixels of good quality (fast and slow) have a common (overlapping) dynamic range; however, the prior art does not teach or fairly suggest identifying and replacing individual slow response pixels that are of low quality due to saturation.

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following is a description of the cited prior art, as labeled on attached form PTO-892:

- **Prior Art B and C** both disclose, in the very least, a first group of pixels of a first color with a first sensitivity and a second group of pixels of the first color with a second sensitivity.

- **Prior Art D, E, F, and I** all disclose, in the very least, a pixel with multiple sensitivities altered by multiple integration periods, multiple charge capturing areas, and various light sensitivities in an effort to extend the dynamic range of the respective image sensors.

- **Prior Art G** disclose, in the very least, changing the spectral characteristics of individual pixels by means of a color filter array disposed on an array or pixels to optimize the dynamic range of each pixel.

- **Prior Art H and J** disclose, in the very least, adjusting pixel sensitivity, by means of gain adjustment, to correspond with the expected contrast of an image.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Justin P Misleh whose telephone number is 703.305.8090. The Examiner can normally be reached on Monday through Thursday from 7:30 AM to 5:30 PM and on alternating Fridays from 7:30 AM to 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Wendy R Garber can be reached on 703.305.4929. The fax phone number for the organization where this application or proceeding is assigned is 703.872.9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
August 3, 2004

TUAN HO
PRIMARY EXAMINER